





UCL Business PLC


ANNUAL REPORT 2016



BRINGING INNOVATION TO LIFE


£9,337
Million in Turnover


17
Proof of concept projects
funded with £359,525


45
New patent applications


315
Active licences


67
Spinouts created


74
Equity holdings


231
Patent families


29
Drug discovery projects
in development



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“THE RESOURCES
AND EXPERTISE
OF UCLB ARE
EXTRAORDINARILY
HIGH... THEIR
EXPERTISE IS
PRICELESS AND
ABSOLUTELY
INVALUABLE”.

Professor Sir Mark Pepys FRS FMedSci
Director, Wolfson Drug Discovery Unit
Centre for Amyloidosis and Acute Phase Proteins
Royal Free Campus, University College London

“UCLB HAVE BEEN
A MODEL OF WHAT
A GOOD UNIVERSITY
TTO SHOULD BE”.

Anthony Finkelstein CBE FREng
Professor of Software Systems Engineering UCL

CENGIZ TARHAN

MANAGING DIRECTOR



UCLB TEN YEARS ON

A very warm welcome to the 2016 edition of UCLB's annual report. It's been another exciting and dynamic twelve months, the year we celebrated our tenth anniversary, having changed our name to UCL Business a decade ago.

I'm pleased to report that UCLB's performance continues to improve. In fact, our turnover reached well over £9m (up from last year's £8m), of which nearly £2m was distributed to the university's academics and inventors, with an additional £900,000 going to UCL. Right across our portfolio, we continue to enjoy strong growth in both numbers and value, which we estimate to be in excess of £150m.

Our financial figures only tell part of the UCLB success story. With 17 proof of concept studies and 29 drug discovery projects ongoing; 45 new patents applied for; 74 equity holdings and 315 licences in place which includes 57 new ones, you can see what a productive year the UCLB team has had.

But throughout our work we are driven by, and committed to, our vision: 'To help support and commercialise research from UCL and NHS trusts associated with UCL for the benefit of humankind in its widest sense.' In this way, we expect to contribute to society and the world. It's against this we measure

all we do, while generating a financial return to cover our costs and contribute to the university and our partner hospitals.

In light of this, the establishment of Orchard Therapeutics Limited, which brought in investment of £21m from F-Prime and the UCL Technology Fund, as well as a major licensing agreement with Cell Medica, were two significant transactions for the company. Orchard is seeking to deliver a novel gene therapy solution to children suffering from severe combined immunodeficiency of the immune system (SCID), whilst the Cell Medica partnership will develop modified T cell receptor products for the treatment of cancer. Both agreements support our growing portfolio of gene and cell therapy products with real potential to make significant inroads into the way medical treatments are expected to be delivered in the future.

Four other exciting and innovative portfolio projects are highlighted in this annual report and they also perfectly demonstrate our principles in practice.

Partnership and trust are the cornerstones of the way we work together to bring ideas and innovations from lab to marketplace, for the good of all, as you'll discover in the pages that follow.

It's an honour and privilege to help the best minds in their fields here at UCL to develop and commercialise their new technologies.

DAVID HUNTER

CHAIRMAN



'WE PARTNER WITH THE BEST, BRIGHTEST AND MOST AMBITIOUS MINDS IN SCIENCE.'

A year on from my first annual report as chairman of UCLB, I am delighted to echo the words of our MD, Cengiz Tarhan, that the business does indeed continue to go from strength to strength.

A key factor in helping us move our new technologies from idea to implementation, is our funding partners. They share our commitment and faith in the fantastic work undertaken at UCL.

First there is our very own UCL Technology Fund. It was launched to invest £50 million in commercialising our emerging world-leading research and is funded by the European Investment Fund and Touchstone Innovations PLC.

Also we are a participant in the £40m Apollo Therapeutics Fund, which was created by three global pharmaceutical companies - AstraZeneca, GlaxoSmithKline and Johnson & Johnson - and the technology transfer offices of three world-leading universities: UCL, Imperial College London and the University of Cambridge.

A further example of the importance of our funding partners is Syncona, founded by Wellcome Trust and Cancer Research UK, to partner with the best, brightest and most ambitious minds in science to

transform their ideas into commercial businesses. Working with this innovative investment team we secured our third collaborative spin out - two being featured in this report.

We said farewell to two non-executive directors: Patrick Reeve, Managing Partner of Albion Ventures, who administer our UCL Technology Fund, and Professor Anthony Finkelstein, who took up a new role as Chief Scientific Adviser on Security to the Government. I would like to thank them both for their significant contributions.

We had two new non-executive directors join the UCLB board and I am very pleased to welcome them both. Magnus Goodland, chief of staff to Lord Rothschild, who has a background in investment and venture capital with particular experience of technology transfer. Magnus has held senior roles at Hermes and IP Group PLC.

Dr Paul Atherton, who is a fellow of the London Business School and the Institute of Physics also joined us. Paul is a successful, serial, technology entrepreneur with an extensive background in start-up companies in which he has undertaken a variety of roles from angel investor and founder to chairman.

We hope you enjoy this year's report; if you would like to know more about the work we do please do not hesitate to get in touch.

ABOUT US

HOW WE CAN HELP YOU?

Here at UCL Business (UCLB) we bring innovation to life. The UCLB team is responsible for technology development and commercialisation transactions for the university. As such we help to market truly world-leading, world-changing innovations; ideas that have a real and positive impact on people's lives.

In fact, we were one of the very first first technology commercialisation companies. Today we're one of the top technology transfer organisations – particularly in the field of healthcare - supporting the research of the academics at one of the UK's top research-led universities, UCL, as well as its partner NHS Trusts.

We work with staff across...

- University College London Hospital
- Moorfields Eye Hospital
- Great Ormond Street Hospital for Children
- The Royal Free London Hospital

...to support exceptional research and clinical practice for positive social health and economic benefit.

In addition, we've a track record and reputation for independence, best practice, adding value and, of course, for identifying, protecting and nurturing the most promising novel ideas.

So from technology transfer, intellectual property licensing and protection to company incubation and investment, we successfully bridge the gap between lab and market, between the expertise and innovations of UCL's academics and industry, for the good of all.

OUR VISION –

Our vision is 'To help support and commercialise research from UCL and NHS trusts associated with UCL for the benefit of humankind in its widest sense.'

This supports UCL's Grand Challenges of increasing our positive impact on and contribution to:

- Global Health
- Sustainable Communities
- Intercultural Interaction
- Human Wellbeing.

The ultimate objective of the research and innovation we undertake at UCL is focused on our Grand Challenges; against which UCLB benchmark all we do.

HOW WE DO IT –

We deliver the complete commercialisation solution
We can provide you with a total, end-to-end capability. This ranges from intellectual property (IP) protection, patent registration and support for the creation of new businesses, through to the licensing and sale of technologies to industry partners.

You can rely on our highly experienced, expert business managers and project management team to work with you every step of the way, right from your technology's earliest stages. Via proof of concept studies and market research we'll steer your novel idea to a position where its potential can be fully realised.

At that point, we'll help ensure your IP is protected and determine whether licensing or forming a spinout company is your best route to market. Our expertise ranges from identifying and negotiating with possible licensing partners to developing and delivering the complete structure – the people, plan and funding - that a new and sustainable spin-off enterprise needs.

ALL THE SUPPORT YOU NEED, ALL AT THE RIGHT TIME

Invention disclosure

The academics at UCL and our associated institutions create many commercially promising ideas. Our role is to carefully select those with the best chance of commercial success and help develop and launch them.

Proof of concept

Transforming an idea into a proven innovation, so that its performance and commercialisation potential can be realised, takes experience, expertise and funding. We can provide you with all three and more.

Patenting

Any intellectual property (IP) you create along with your technology is a valuable asset. So our patent team will identify the strategy that offers the best protection for it while managing the essential legal formalities.

Project management

Expert project management enables you to concentrate on research and development while we take care of the business while ensuring commercial strategy can be incorporated from the start. We will take your project through the regulatory process, providing expertise and support.

Internal and external funding

We can find the funding that's the best fit for your project. We can access significant sources from within UCL, the UCL Technology Fund, our own organisation and beyond - such as research councils and venture capitalists.

Marketing and negotiations

When there's likely to be a choice of routes to market for your innovation, we've vast experience of identifying the best exit point for it, whether that be licensing, joint venture or the creation of a new, spin-out enterprise.

Licensing

If licensing your technology is deemed the best route to market, our business managers will find industry partners that could benefit from it, negotiate agreements and provide you with comprehensive advice and support facilities.

Spinouts

We've a successful track record for creating successful spinout businesses in key new industries. So if your technology could be better served by forming a new company, we'll establish, brand, fund, manage, promote and incubate it. And we're there for the long term, usually retaining a stake in the new enterprise.

Social enterprise

If you want to start a social enterprise arising from your research - to address social or environmental needs, reinvest profits into the community or back into the business - start with us. We were the first technology transfer organisation to appoint business managers for social enterprise. Our pioneering spirit in this field continues.

ADDING THE VALUE THAT ADDS UP TO SUCCESS

We believe it's not enough to simply deliver a technology transfer solution - it's the value we add at every stage that delivers the difference. This level and quality of support ensures more of UCL's novel ideas, innovations and technologies make the transition into marketable products and services for societal benefit and impact.

UCL IN OVERVIEW –

Building an exciting future on the firm foundations of our past

- launched in 1826 as London University
- the first university established in the capital, to be secular and admit women
- 29 Nobel Prize winners and three fields medalists amongst our alumni and current and former staff
- deep roots in medicine, healthcare and medical technology - played key roles in many important breakthroughs, from the discovery of the structure of DNA to the discovery of hormones
- part of UCL Partners, integral to the world's largest academic health science centre
- a world's leading multidisciplinary research university, ranked highly in national and international league tables
- first technology transfer company founded in 1989, became UCL Business PLC (UCLB) in 2006.

OUR ROUTE TO MARKET

Number of active projects
This diagram shows the number of our active projects at each stage of the development process as of July 2016.



KEY

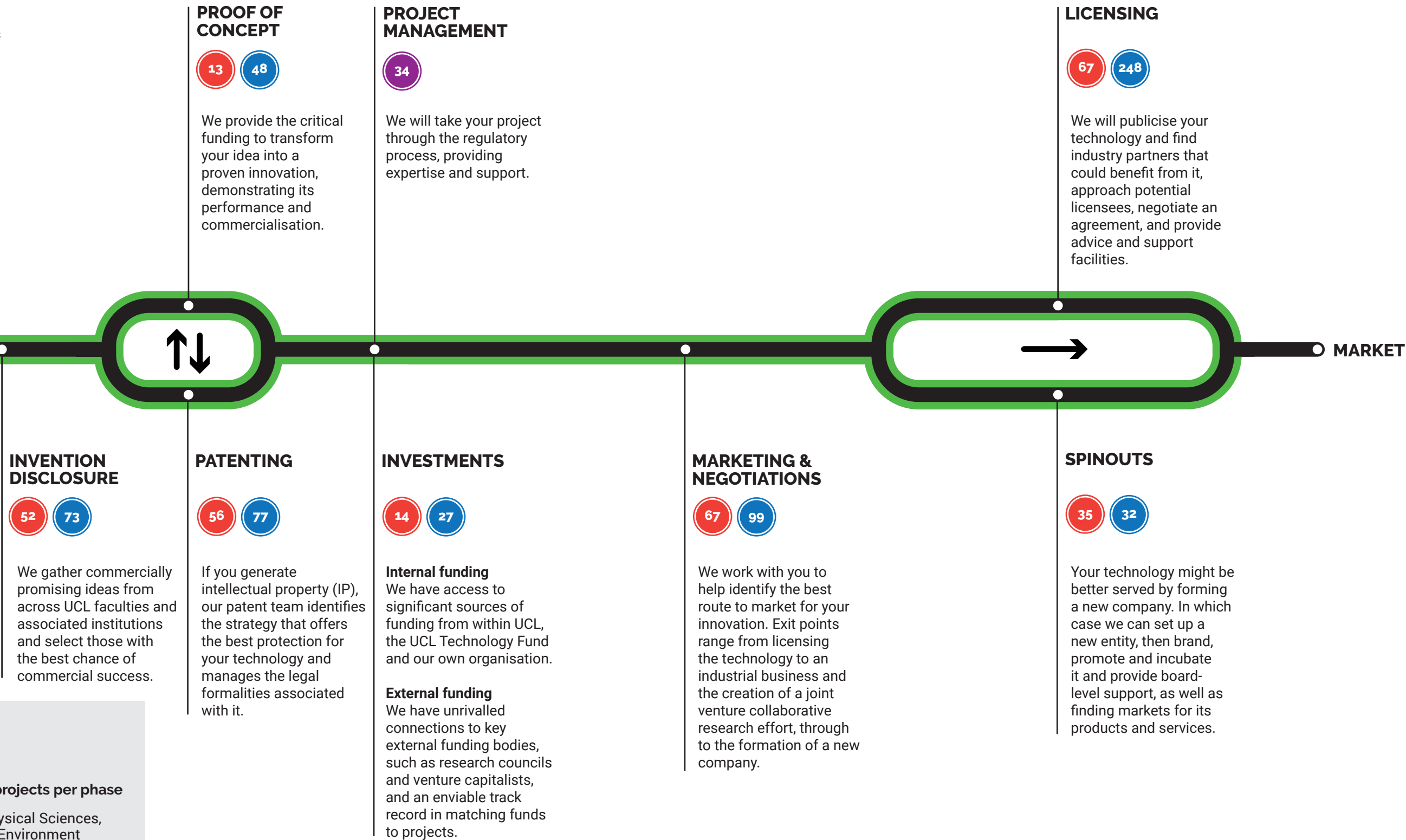
UCLB activity

Total number of active projects per phase

Engineering, Physical Sciences, Arts & the Built Environment

Biomedical Sciences

Project Management



* Great Ormond Street Hospital for Children NHS Foundation Trust

Moorfields Eye Hospital NHS Foundation Trust

Royal Free London NHS Foundation Trust

University College London Hospitals NHS Foundation Trust

HAS ACHILLES THERAPEUTICS FOUND LUNG CANCER'S ACHILLES HEEL?



In the United States, lung cancer results in about one in four cancer deaths - that's more people than die of colon, breast and prostate cancers combined. According to the American Cancer Society's estimates there will be over 222,500 new cases of lung cancer diagnosed in the country in 2017, and more than 155,000 will die from it.

In the UK, according to Cancer Research UK's statistics, there will be around 36,000 deaths annually from lung cancer.

BUT COULD WE SOON BEAT THIS AWFUL DISEASE?

Truncal neo-antigens are created early in lung cancer's evolution. They are present on all cancer cells in an individual patient's tumour. But, crucially, they are not present on the patient's healthy cells. This could enable scientists to target and destroy tumours without harming healthy tissues.

These neo-antigens were first discovered by scientists at Cancer Research UK, the Francis Crick Institute and the UCL Cancer Institute, in studies funded by the NIHR University College London Hospitals (UCLH) Biomedical Research Centre (BRC).

By targeting the very mechanism cancer cells use to evade traditional therapies, a new enterprise has been formed which could prove to be cancer's Achilles heel.

TARGET TUMOURS, SAFEGUARD HEALTHY TISSUE

Achilles Therapeutics' mission is to develop next-generation, patient-specific therapies that harness the immune system to destroy cancer cells. Their therapies will target the truncal (also known as clonal) tumour neo-antigens - the Achilles heel mentioned above - which are the unique flags to the immune system that are present on the surface of every cancer cell.

Targeting these truncal mutations provides the ideal route to direct a therapy to every cancer cell in an individual, whilst sparing healthy tissue.

Achilles Therapeutics brings together four scientific founders with world leading expertise in the understanding of cancer evolution, bioinformatics and the development of immunotherapies. The new company is headquartered in London and was launched in May 2016 with a financing round of £13.2m (\$17.5m) led by Syncona with the Cancer Research Technology Pioneer Fund and the UCL Technology Fund.

THERAPY TAILORED TO EVERY PATIENT

Professor Charles Swanton from the UCL Cancer Institute, who is the scientific founder of Achilles Therapeutics and a group leader at the Francis Crick Institute, commented, 'Our research could provide a truly personalised approach to lung cancer therapy by targeting cell surface markers that are specific to each patient and present on all cancer cells. We're delighted to be able to bring this exciting science closer to the clinic.'

Iraj Ali, partner with Syncona LLP and director of Achilles Therapeutics, said, 'We believe we are working with the world leaders capable of exploiting the confluence of two of the most exciting and innovative fields in healthcare today: cancer bioinformatics and immuno-therapy.'

The company's CEO, Chris Ashton, added, 'Bringing all of these major players together holds great promise for non-small cell lung cancer patients.'



WHAT HAPPENS WHEN PEOPLE LACK FACTOR IX?



When most of us cut ourselves we bleed. Then, usually, substances in our blood known as clotting factors combine with blood cells called platelets to make the blood sticky. Your blood clots and the bleeding stops.

However, people with haemophilia haven't as many clotting factors as they should have in their blood, so they bleed for longer than usual. The condition is inherited, passed to a child by one or both of their parents but usually down the male line. While there are about 6,000 people with haemophilia in the UK, it's a global problem. Worldwide, it's estimated that one boy in every 5,000 will be born with haemophilia A and one in every 30,000 with haemophilia B.

Deficiency of a protein called factor IX (also known as the Christmas factor from the surname of the first boy discovered to be lacking it) causes haemophilia B.

A NEW ENTERPRISE TO TAKE FORWARD A NEW THERAPY

Pioneered by Professor Amit Nathwani, Professor of Haematology at UCL, a new gene therapy treatment has begun to transform the lives of haemophilia patients by providing a safe, reliable source of the blood clotting protein factor IX. The professor is also founder and Chief Scientific Officer (CSO) of a company - Freeline Therapeutics - created specifically to develop the therapy.

Freeline Therapeutics was launched in December 2015 by Syncona LLP and UCLB. The company is based at the Royal Free Hospital in London. Their mission is to become a leading biopharmaceutical company for the successful development and commercialisation of liver-directed gene therapies for bleeding disorders and other severe diseases.

A SINGLE TREATMENT, LONG TERM BENEFITS

Freeline's therapies, delivered in one single treatment, have the potential to provide long-term benefits to patients by carrying a therapeutic gene to a target cell in the body. These therapies are based on the company's next-generation proprietary adeno-associated virus (AAV) vector platform.

Freeline's lead programme is a gene therapy to treat haemophilia B, which is expected to be in the clinic late 2017.

Professor Nathwani commented, 'Our initial study has shown the potential of AAV gene therapy. Freeline will bring industry-leading development people and our expertise together to ensure our clinical translation is rapidly converted to registered therapeutics.'

Cengiz Tarhan, Managing Director of UCLB, added, 'UCL is a world leader in the biomedical sciences, with a commitment to outstanding research and translation into healthcare benefits for patients. I am pleased that Professor Nathwani's work is being taken forward in a commercial environment in a way that may benefit patients globally. UCLB are delighted to be able to partner with Syncona to launch the company.'



HOW ACADEMIC ALGORITHMS HELP INDUSTRY SOLVE ITS TOUGHEST PROBLEMS

SATALIA

We solve hard problems



Imagine you're the manager of a small company with one van and driver who regularly delivers to a couple of dozen drops in and around your local area.

It's fairly 'easy' to work out a route that enables your driver to visit each drop once and return to the depot before the end of the working day. But it's extremely 'hard' to find the optimal route – the one that's quickest and uses least fuel. For example, if your driver had 24 drops to make there'd be 24 x 23 x 22 x... multiplied all the way down to 1 possible route. That's over 620 billion trillion potential ways to go. And if a supercomputer could calculate 1 million routes every second it would take 20 billion years (longer than the age of the universe) to sort through all the options to determine the optimal one.

HERE'S WHERE IT GETS REALLY COMPLICATED

Most prescriptive problems in industry are many times more complex than for our one man, one van operation. Imagine how complicated such a calculation could be for a worldwide logistics operation. It's easy to spot hard optimisation problems - anything that involves the planning, scheduling, routing and mixing of resources. In fact, any form of resource allocation in commerce is an optimisation problem.

For example, says Dr Daniel Hulme, co-founder and CEO of Satalia, 'We get a lot of enquiries from companies wanting to optimise their delivery routes. This is a classic example of a computational issue known as the 'Travelling Salesman Problem'. They're insanely complex to solve.'

The process of using data science to more accurately predict outcomes is called predictive analytics. But it's also the hardest part of data-driven decision-making. Daniel explains, 'Decision science is the crucial missing component. It will enable business to leverage the true benefits of data, data-science and, our core strength, optimisation.'

'And optimisation's going to be the key differentiator for business success in our rapidly growing, complex, connected and competitive world. This is exactly what Satalia delivers by bringing together our expertise and technology in optimisation, decision science, data-science and software development,' he adds.

THE SOLVE ENGINE DELIVERS THE DIFFERENCE

Satalia spun out of UCL in 2008 but key figures from the university and UCLB are still closely involved and retain a 20% shareholding in the company.

Satalia's Solve Engine is what differentiates it from artificial intelligence (AI) consultancies. This innovative black-box technology, invented by Daniel a decade ago, harnesses thousands of optimisation algorithms and makes them seamlessly available to industry, in products they love to use. As he says, 'Ask a search engine a question and you hope to get back the best results. Ask our Solve Engine an optimisation problem and you will get back the best solution.'

Now with nearly 60 of the field's finest minds onboard, the Satalia team designs end-to-end optimisation solutions for every kind of enterprise. Right from fledgling start-ups to Fortune 500 companies, from global entertainment groups and telecoms to retailers.

PUBLIC ACCESS TO LOW-COST, HIGH-QUALITY OPTIMISATION-AS-A-SERVICE

Daniel's ambition for Satalia is for it to 'Democratise decision making through public, widespread and easy access to a Solve Engine.' Some of the advanced and confidential projects the team are working on will allow people to solve everyday problems through a natural language interface: true AI.

Little wonder Satalia was recently recognised as a Gartner Cool Vendor in Data-Science, the only UK company of five chosen globally. With its technology, ambition and unique, flat and open organisational structure, Satalia is attracting attention from global talent and top-tier clients.

SOWING THE SEEDS OF CHANGE

endomag+

A collaboration started in 2003 by academics from UCL and the University of Houston and funded by the UK's Department of Trade and Industry, has led to the development of innovative magnetics-based medical devices which provide guidance to surgeons during cancer related surgical procedures. The spinout company Endomagnetics Ltd (now Endomag) was established in 2007 to commercialise this leading-edge technology.

TINY PARTICLES, HUGE BENEFITS – THE POWER OF MAGNETIC FIELDS

Endomag's initial application was in 'sentinel' lymph node location, a key step in the breast cancer staging protocol. In this, a proprietary fluid – Sienna+® - containing minute superparamagnetic iron oxide nanoparticles are injected before surgery. These accumulate in the sentinel lymph nodes which are first to receive drainage from a tumour and thus indicate whether a cancer has spread from the breast.

A Sentimag® probe is then used like a metal detector to identify the minute magnetic signature given off by Sienna+® fluid. This helps clinicians locate, excise and analyse those nodes.

SENTIMAG® AND SIENNA+® CHANGE THE GAME

Conventional radioactive tracers used for detecting lymph nodes create restrictive, time-sensitive and safe handling issues. Sienna+® doesn't.

For example, the timing of a radioactive tracer injection has to be carefully matched to the half-life of the radioisotope and the surgeon's schedule. By contrast, just 20 minutes after the injection of the Sienna+® nanoparticles, they've migrated to the sentinel lymph nodes and the surgeon can operate.

Also Sienna+® has a three-year shelf-life not the six-hour half-life of a radioactive tracer, so clinics far from nuclear medicine facilities – in developing countries, for example – can undertake sentinel lymph node biopsies.

Finally, the Endomag solution is competitively priced, fast and easy to use and robust.

BUILDING ON SUCCESS

Endomag's many clinical champions asked the company to enhance its magnetic sensing technology so that it could be used to mark early stage tumours, and in 2016 Endomag launched Magseed®.

Clinicians removing breast cancer tumours want to minimise procedural time and healthy tissue removal. This makes accurately pinpointing tumours vital. Radiologists currently mark the tumour by inserting a guide wire but these can cause discomfort and anxiety for the patient and are also restrictive for the surgeon.

Magseed® marks breast cancer tumours with a magnetic seed the size of a grain of rice. Guided by ultrasound or mammography a radiologist places the seed into the site of a tumour up to 30 days in advance of surgery, helping the surgeon's scheduling as well as their locating of the tumour. The seed is visible to X-rays and ultrasound and is designed to integrate into the tumour's structure so it doesn't move.

Dr Eric Mayes, CEO of Endomag commented, 'Magseed is enabling the company to achieve year-on-year triple-digit growth and 2017's revenues will exceed £5 million. With advanced laparoscopic and endoscopic probes under development to guide surgeons in melanoma, prostate, thyroid, colon and cervical cancers, the Endomag story is just beginning. It's a privilege to be leading an enterprise that makes such a positive difference to people's lives.'

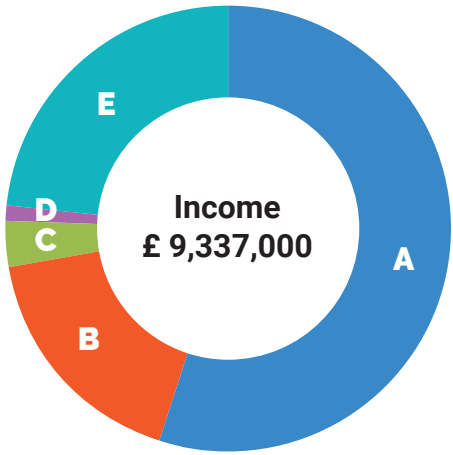


UCLB GROUP ACTIVITY

SUMMARY RESULTS

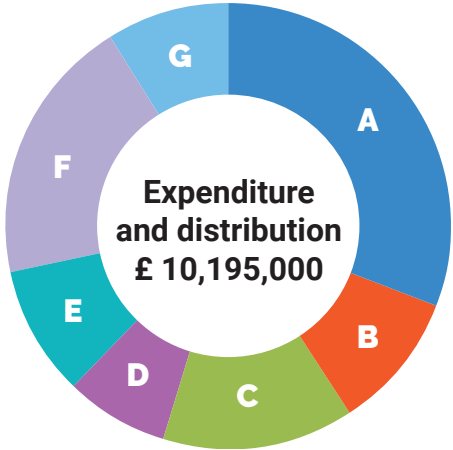
INCOME ANALYSIS FOR 2015/16 –

A	Royalties and intellectual property income	(£'000)	5,147
B	Services to UCL		1,620
C	Research and proof of concept funding		297
D	Interest		113
E	Other		2,160
			9,337



EXPENDITURE ANALYSIS FOR 2015/16 –

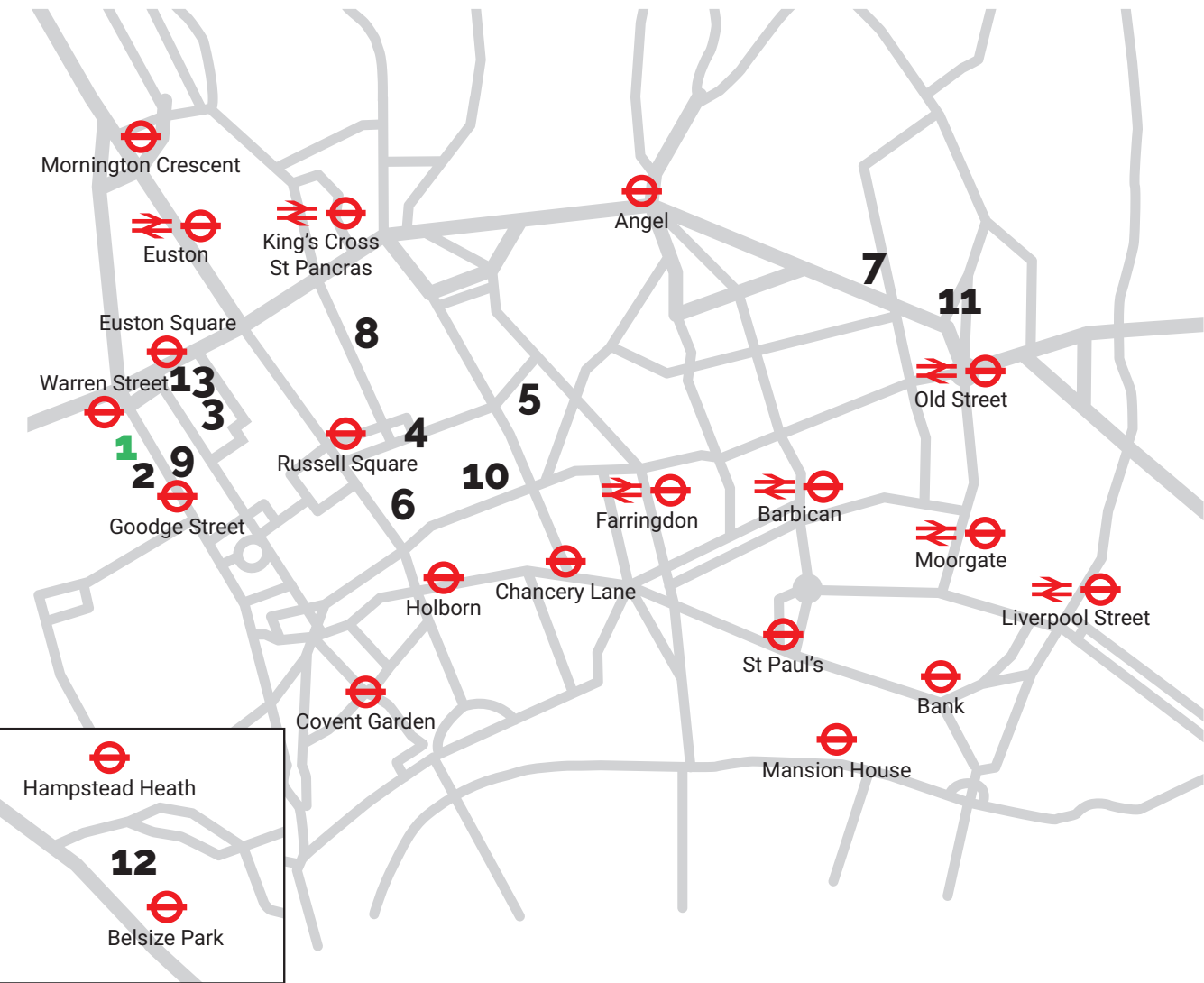
A	Staff costs	(£'000)	3,168
B	Research and consultancy		1,007
C	Patent costs		1,428
D	Premises		765
E	Other		950
			7,318



DISTRIBUTION FOR 2015/16 –

F	Distributions to academics and inventors	1,974
G	Distributions to UCL	903
		2,877

FIND OUT MORE



Locations

1. UCL Business PLC & UCL Consultants
2. UCL Innovation and Enterprise
3. University College London (UCL)
4. UCL Institute of Child Health
5. UCL Eastman Dental Institute
6. UCL Institute of Neurology
7. UCL Institute of Ophthalmology
8. UCL School of Pharmacy

Partner Hospitals

9. UCL Partners
10. Great Ormond Street Hospital for Children
11. Moorfields Eye Hospital
12. Royal Free London
13. University College London Hospitals

The above figures include those of UCL Business PLC and companies administered by UCL Business PLC, including UCL Cruciform and Pentraxin Therapeutics

Full sets of accounts are available from:
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